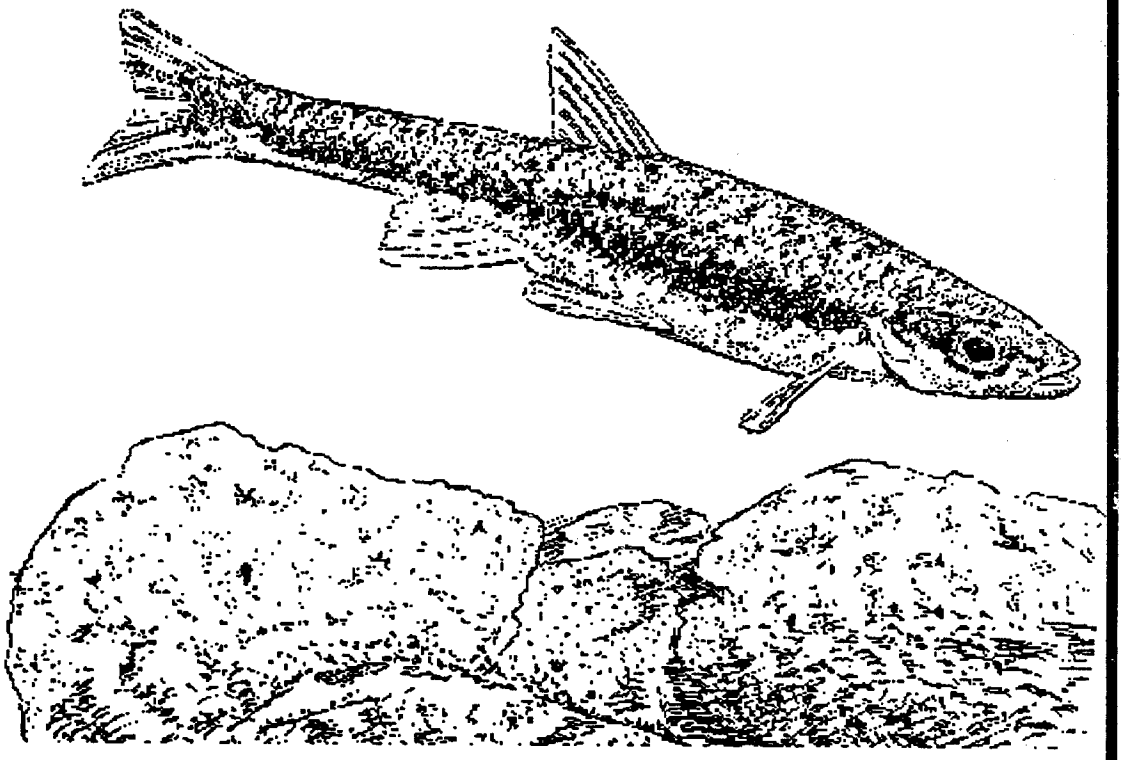
BLACKSIDE DACE

RECOVERY PLAN



U.S. Fish and Wildlife Service
Atlanta Georgia

RECOVERY PLAN

for

Blackside Dace (*Phoxinus cumberlandensis*)

Prepared by:

Richard G. Biggins

Asheville Field Office

U. S. Fish and Wildlife Service
Southeast Region, Atlanta, Georgia

Approved: _____
Regional Director, U.S. Fish and Wildlife Service

Date: August 17, 1988

THIS IS THE COMPLETED BLACKSIDE DACE RECOVERY PLAN. IT HAS BEEN APPROVED BY THE U.S. FISH AND WILDLIFE SERVICE. IT DOES NOT NECESSARILY REPRESENT OFFICIAL POSITIONS OR APPROVALS OF COOPERATING AGENCIES, AND IT DOES NOT NECESSARILY REPRESENT THE VIEWS OF ALL INDIVIDUALS WHO PLAYED A ROLE IN PREPARING THIS PLAN. THIS PLAN IS SUBJECT TO MODIFICATION AS DICTATED BY NEW FINDINGS, CHANGES IN SPECIES STATUS, AND COMPLETION OF TASKS DESCRIBED IN THE PLAN. GOALS AND OBJECTIVES WILL BE ATTAINED AND FUNDS EXPENDED CONTINGENT UPON APPROPRIATIONS, PRIORITIES, AND OTHER CONSTRAINTS.

ACKNOWLEDGEMENTS SHOULD READ AS FOLLOWS:

U.S. Fish and Wildlife Service. 1988. Blackside Dace Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, Georgia. 23 pp.

ADDITIONAL COPIES MAY BE PURCHASED FROM:

Fish and Wildlife Reference Service
Informatics General Corporation
6011 Executive Blvd.
Rockville, Maryland 20852

Telephone: 301/770-3000
1-800/582-3421

TABLE OF CONTENTS

PART I

INTRODUCTION

The blackside dace (Phoxinus cumberlandensis) was listed as a threatened species on June 12, 1987 (52 FR 22580). This fish likely historically inhabited many of the small moderate gradient cool-water streams in the upper Cumberland River system in southeastern Kentucky and northeastern Tennessee. However, primarily due to the impacts of siltation from coal mining, silviculture, agriculture, and road construction and the impacts of unregulated acid mine drainage, residential development, and impoundments, the species is now restricted to 35 short stream reaches (an estimated total of about 17 stream miles).

Former and Present Distribution

A 1981 blackside dace study (Starnes 1981) sampled 168 upper Cumberland River streams and found the fish in 27 of the streams. A more recent status survey (O'Bara 1985) of 193 upper Cumberland River basin sites reported the species present in 30 streams. Table 1 provides a list of all streams found to be inhabited by the species. Starnes (1981) concluded, based on physical habitat requirements, that the fish could have been eliminated from at least 52 other waters before the species' existence was known. In O'Bara's 1985 study, he reported the species extirpated from 10 streams that Starnes (1981) had found the fish in (Table 2). In 1987 two new populations (Mill Creek and Cutlick Creek) were discovered, and the fish was found to inhabit two additional Beaver Creek tributaries and also a short reach of the Beaver Creek in McCreary County, Kentucky (personal communication, Christopher O'Bara, Tennessee Technological University, 1988, and Douglas Stephens, Kentucky Department of Fish and Wildlife Resources, 1988).

Description, Ecology, and Life History

The blackside dace was described by Starnes and Starnes (1978a). Adults (generally less than 3 inches long) have a single black lateral stripe, a green/gold back, numerous dorsolateral speckles, and a pale or sometimes brilliant scarlet belly. The fish's fins are often bright yellow with silver surrounding the base of the pelvic and pectoral fins. The scales are small and embedded, and the lateral scale counts average 75. The lateral line is incomplete, and the anal ray count is 8. The type specimens are located at the Michigan Museum of Zoology. Other specimens are located at the U.S. National Museum of Natural History, the Philadelphia Academy of Science, Eastern Kentucky University, the Chicago Field Museum, Cornell University, the University of Tennessee, and Tennessee Technological University.

Table 1. Inhabited streams/stream reaches, population trend, number of individuals collected, and land ownership for all sites found to contain Phoxinus cumberlandensis. (Modified from O'Bara 1985, plus data supplied through personal communication, Christopher O'Bara, Tennessee Technological University, 1988, and Douglas Stephens, Kentucky Department of Fish and Wildlife Resources, 1988).

Stream	County/ State	Status When Sampled	Number of Individuals Collected	Watershed Ownership	Approximate Length of Habitat (km)	Maximum Stream Width (m)	Threat To Population
Poor Fork	Letcher/KY	P	4	JNF;Pr	0.8	3.6	6
@ Brownies Creek	Harlan/KY	E	24	Pr	2.0	3.0	2
Straight Creek	Harlan/KY	P	2	Pr	?	3.6	3,5,7
@ Davis Branch	Bell/KY	E	10	CGNHP	2.0	2.1	6
@ Little Clear Creek	Bell/KY	G	12	Pr	0.5	3.0	2,3
Mill Creek	Bell/KY	G	6	Pr	0.4	2.1	8
@ Sims Fork	Bell/KY	G	14	Pr	1.5	3.0	1,3,6
Long Branch	Bell/KY	P	2	Pr	0.2	1.5	2,8
Right Fork of Caney Creek	Bell/KY	P	8	Pr	0.4	1.5	2
@ Left Fork of Caney Creek	Bell/KY	E	95	Pr	0.8	1.5	2
Buck Creek	Whitley/KY	P	2	Pr	0.1	3.0	4
@ Buffalo Creek	Claiborne/TN	P	2	Pr	0.5	2.1	2
@ Davis Creek	Campbell/TN	P	2	Pr	0.5	1.5	2,6

Stream	County/ State	Status When Sampled	Number of Individuals Collected	Watershed Ownership	Approximate Length of Habitat (km)	Maximum Stream Width (m)	Threat To Population
Sandlick Creek	Campbell/TN	P	2	Pr	0.5	1.0	2,6,8
@ Youngs Creek	Whitley/KY	E	30	Pr	2.0	4.0	5,7
Becks Creek	Whitley/KY	P	1	Pr;DBNF	0.7	2.4	4
Bucks Branch	Whitley/KY	E	46	DBNF;Pr	1.4	2.4	4
Rose Branch	Whitley/KY	P	1	Pr	0.2	1.5	4
Elk Creek	Campbell/TN	?	2	Pr	?	3.6	5
@ Gum Fork	Scott/TN	G	12	Pr	1.6	3.0	1,2,3,6,7
@ Lawson Creek	Scott/TN	P	1	Pr	0.1	1.0	8
@ Hatfield Creek	Campbell/TN	P	2	Pr	0.3	3.0	1
@ Archers Creek	Whitley/KY	G	9	Pr;DBNF	1.5	3.0	5,7
Trammel Fork	McCreary/KY	G	15	Pr	1.0	3.0	2,5
@ Bunches Creek	Whitley/KY	E	20	DBNF	1.5	2.7	9
@ South Fork of Dog Slaughter	Whitley/KY	P	1	DBNF	0.9	3.0	4
North Fork of Dog Slaughter	Whitley/KY	P	2	DBNF	0.4	3.0	4
@ Eagle Creek	McCreary/KY	G	4	DBNF;Pr	1.5	2.1	4,7

Stream	County/ State	Status When Sampled	Number of Individuals Collected	Watershed Ownership	Approximate Length of Habitat (km)	Maximum Stream Width (m)	Threat To Population
@ Big Lick Branch	Pulaski/KY	E	32	DBNF	0.9	2.1	4
#@ Middle Fork of Beaver Creek	McCreary/KY	E	21	DBNF	?	1.5	8
#* Freeman Fork of Beaver Creek	McCreary/KY	E	60	DBNF	1.6	2.4**	4
#* Drury Branch of Beaver Creek	McCreary/KY	P	2	DBNF	?	2.1**	4
#* Beaver Creek	McCreary/KY	P	2	DBNF	0.3	6.0**	4
* Mill Creek	McCreary/KY	E	30	DBNF;Pr	2.5	2.4**	4,2
* Cutlick Creek	McCreary and Whitley/KY	P	4	DBNF	0.1	2.1**	4

@ Inhabited streams/stream reaches reconfirmed by O'Bara (1985)
# These are part of one population complex
* Inhabited stream reaches discovered since O'Bara 1985
** Average stream width - no maximum width data available
P: Poor available data
G: Good
E: Excellent
JNF: Jefferson National Forest
CGNHP: Cumberland Gap National Historic Park
DBNF: Daniel Boone National Forest
Pr: Private

1: existing mining
2: orphan mine reopened
3: new mine
4: logging
5: agriculture
6: road construction
7: human development
8: natural low flow
9: non-apparent

Table 2. Streams previously reported (Starnes 1981) to contain Phoxinus cumberlandensis but believed to have extirpated populations. (Taken from O'Bara 1985.)

Stream	County/State Reported	Last	Probable Cause of Decline
Colliers Creek	Letcher/KY	1979	mining; small population*(1)
Cloverlick Creek	Harlan/KY	1961	mining; rotenone sample
Little Poplar Creek	Knox/KY	1976	mining
Louse Creek	Campbell/TN	1979	mining
Sanders Creek	Whitley/KY	1981	construction; mining
Trammel Creek	Campbell/TN	1981	construction; drought
Cane Creek	Whitley/KY	1977	small population*(3)
Marsh Creek	McCreary/KY	1981	agriculture
Ned Branch	Laurel/KY	1977	mining; small population*(2)
Craig Branch	Laurel/KY	1977	agriculture; small population*(1)

*(N): number of individuals reported

The blackside dace inhabits cool (rarely exceeding 70°), small (7-15 feet wide), upland streams with moderate flows (Starnes and Starnes 1978a, Starnes 1981, O'Bara 1985). The fish is generally associated with undercut stream banks and large rocks, and it is usually found within well-vegetated watersheds with good riparian vegetation (Starnes 1981). Stable watersheds with good riparian zones and dense forest cover help to maintain cool water temperatures and minimize the runoff of silt from agriculture (primarily corn and livestock operations), coal mining, road construction, logging activities, and other land use practices. It has been found that the fish's presence is apparently closely correlated with healthy riparian vegetation where canopy cover exceeds 70 percent and where stream flows are sufficient to remove silt from areas just downstream of the riffles (O'Bara 1985). The fish has not been found in low gradient, silty streams nor in high gradient, mountain tributaries (O'Bara 1985).

Starnes (1981) reported on the feeding habits of the blackside dace. He observed the species in schools of 5 to 20 individuals grazing on rocks and on sandy substrate. He also presumed that the fish feed a great deal beneath stream banks among root hairs and brush. Sand was the largest component by volume (36 percent) in the fish's gut. Unidentified organisms comprised 32 percent, algae and diatoms made up 12 percent, and invertebrates were represented by about 4.5 percent.

Spawning was observed by Starnes (1981) on a mostly overcast day in mid-May at around 1500 hours. Water temperature was 17.5°C (63.5°F), and the site was a stoneroller's (Campostoma anomalum) nest located in a gravel run near an undercut bank. This nest was a shallow pit composed of gravel of various segregated sizes with the finer gravel on the pit's upstream lip. The blackside dace spawned upon the finer gravel. The author speculated that as the stream was silty, the stoneroller nest provided the only clean gravel and that under less silty conditions the dace would have more spawning habitat.

Starnes (1981) reported the sex ratio in September was 21 males: 29 females and in April was 11 males:11 females. Based on length/frequency and scale data, growth rates are similar for males and females (age 0, 20-24 mm standard length (SL); age I, 39-57 mm SL; and age II, 62-64 mm SL). Population densities are unknown. However, in electrofishing sampling conducted in 1984 and 1985 at 30 stream reaches inhabited by the species, 6 stations yielded more than 20 individuals, and 15 stations yielded less than 5 specimens (O'Bara 1985). The species' limiting factors are not fully understood, but riparian vegetation, vegetative canopy, pools with undercut banks, and minimal siltation appear to be important factors (Starnes 1981, O'Bara 1985).

Reasons for Decline and Threats to Its Continued Existence

The areas of Kentucky and Tennessee inhabited by the fish are rich in coal reserves and forest resources, and it is believed that impacts associated with the development of these resources caused the loss of many blackside dace populations (Starnes 1981, O'Bara 1985). Many streams in the upper Cumberland River basin have been affected by acid mine drainage and excessive siltation associated with strip mining, highway construction, and poor land use (Harker et al. 1980). The most frequently cited threat (O'Bara 1985) was coal-mining-related problems, followed in order of threat by logging, road construction, agriculture, human development, and naturally low stream flows. Only one stream (Bunches Creek) described in the 1985 status survey (O'Bara 1985) was not threatened by some factor.

The southern redbelly dace (Phoxinus erythrogaster), a comparatively more recent (geologically) component of the upper Cumberland River basin fauna, is now present in many basin streams (Starnes and Starnes 1978b, Starnes 1981). It has been suggested that this fish "...may have displaced the blackside dace to some degree in some of those streams that are less upland in character" (Starnes 1981). The redbelly dace has become established in areas where the water and habitat quality have been altered by human activities to create warmer and more turbid conditions. However, Starnes (1981) stated that the blackside dace seemed able to persist and outcompete the redbelly dace in the better quality habitats.

The species' historic distribution was likely much more continuous than present. Now the small populations are isolated from each other by extremely degraded habitat, and the exchange of genetic material among some of these populations is likely infrequent or nonexistent. If isolation continues, some of the smaller populations may have insufficient genetic variability to maintain long-term viability.

PART II
RECOVERY

A. Recovery Objectives

The ultimate goal of this recovery plan is to restore viable populations* of the blackside dace (Phoxinus cumberlandensis) to a significant portion of its historic range and then remove the species from the Federal List of Endangered and Threatened Wildlife and Plants. The species will be considered for removal from Endangered Species Act protection when the following criteria are met.

1. Each of the eight subbasins identified in Table 3 has a viable population comprised of at least three protected, inhabited stream reaches per subbasin.

2. Each of the 24 stream reaches is protected in some manner, either through public agency or private conservation organization ownership or some form of permanent easement, and a management plan has been implemented for each stream that provides for the species' long-term protection.

3. No foreseeable threats exist that would threaten survival of the species in any of the subbasins.

4. Noticeable improvements in coal-related problems and substrate quality have occurred to the species' habitat throughout the upper Cumberland River basin, and the species has responded through natural means or with human assistance to successfully recolonize other streams and stream reaches within the upper Cumberland River basin.

*Viable populations: A reproducing population that is large enough to maintain sufficient genetic variation to enable it to evolve and respond to natural habitat changes. Movement of animals within some subbasins may be required to maintain genetic viability. The number of individuals needed and the length of stream reaches required to meet this criterion will be determined for the species as one of the recovery tasks.

Table 3. Distribution and number of stream reaches per subbasin presently known to be inhabited by the blackside dace (Phoxinus cumberlandensis) and the distribution and number of inhabited stream reaches by subbasin that must be present before this fish can be considered for removal from the Federal list of endangered and threatened species.

Subbasin	Number of Inhabited Streams At Present	Number of Protected Inhabited Streams Required Per Subbasin to Reach Recovery
Poor Fork Drainage	1	3
Cumberland River Tributaries from Clover Fork to Clear Creek	3	3
Straight Creek Drainage	6	3
Clear Fork Drainage	5	3
Jellico Creek Drainage	7	3
Marsh Creek Drainage	1	3
Cumberland River Tributaries above Cumberland Falls from Youngs Creek to Bunches Creek except Jellico Creek and Marsh Creek	3	3
Cumberland River Tributaries below Cumberland Falls	9	3
	—	—
Total	35	24[1]

[1]The number of population segments needed for recovery is less than the number presently known to exist. Therefore, some presently known marginal populations may be lost. Measures should be taken to protect all presently known populations, but some of them are so small and tenuous that it is unlikely they can survive.

B. STEP-DOWN OUTLINE

1 Preserve present populations and presently used habitat.

1.1 Continue to utilize existing legislation and regulations (Federal Endangered Species Act, Federal and State surface mining laws, water quality regulations, stream alteration regulations, etc.) to protect the fish and its habitats.

1.2 Solicit help in protecting the species and its essential habitats.

1.2.1 Coordinate with the U.S. Forest Service, National Park Service, Office of Surface Mining, Kentucky Protection Planning Committee, and Tennessee Protection Planning Committee to identify which populations within each subbasin are critical to maintenance and recovery.

1.2.2 Meet with local government officials and regional and local planners to inform them of our plans to attempt recovery and request their support.

1.2.3 Meet with the public, local landowners, and local business and/or industry interests and try to elicit their support in implementing protective actions.

1.2.4 Develop an educational program using such items as slide/tape shows, brochures, etc. Present this material to business groups, civic groups, youth groups, church organizations, etc.

1.3 Determine threats to the species, conduct research necessary for the species' management and recovery, and implement management where needed.

1.3.1 Characterize the species' habitat (relevant physical, biological, and chemical components) for all life history stages.

1.3.2 Conduct life history research on the species to include reproduction, food habits, age and growth, mortality factors, etc.

1.3.3 Determine present and foreseeable threats to the species.

1.3.4 Based on the biological data and threat analysis, investigate the need for management,

including habitat improvement. Implement management, if needed, to secure viable populations.

1.3.5 Determine the number of individuals required to maintain a viable population.

2 Search for additional populations and/or habitat suitable for reintroduction efforts.

3 Determine the feasibility of reestablishing the blackside dace back into historic habitat and reintroduce where feasible.

3.1 Develop a successful technique for reestablishing populations.

3.2 Coordinate with the U.S. Forest Service, National Park Service, Kentucky Protection Planning Committee, and Tennessee Protection Planning Committee to identify unoccupied habitat within each subbasin which could be utilized for reintroductions and which could be successfully protected after populations become established.

3.3 Reintroduce the species back into their historic range and evaluate success.

3.4 Implement the same protective measures for any introduced populations as outlined for established populations.

4 Develop and implement a program to monitor population levels and habitat conditions of presently established populations as well as newly discovered, introduced, or expanding populations.

5 Annually assess overall success of the recovery program and recommend action (changes in recovery objectives, delist, continue to protect, implement new measures, other studies, etc.).

C. NARRATIVE OUTLINE

1 Preserve present populations and presently used habitat. Until those specific populations and habitats are identified which are required for recovery, it is essential that all populations are protected.

1.1 Continue to utilize existing legislation and regulations (Federal Endangered Species Act, Federal and State surface mining laws, water quality

regulations, stream alteration regulations, etc.) to protect the fish and its habitats. Prior to and during implementation of this recovery plan, the species and its habitat can be protected by the full enforcement of existing laws and regulations.

1.2 Solicit help in protecting the species and its essential habitats. Activities under Section 7 of the Endangered Species Act and Fish and Wildlife Coordination Act can assist in protection of the species, but these programs alone cannot recover the blackside dace. The assistance of Federal and State agencies and conservation groups as well as local governments will be essential. Also, support of the local industrial and business community as well as local people will be needed to meet the goal of recovering the species. Without a commitment from the people in the upper Cumberland River valley who have an influence on habitat quality, recovery efforts will be doomed.

1.2.1 Coordinate with the U.S. Forest Service, National Park Service, Office of Surface Mining, Kentucky Protection Planning Committee, and Tennessee Protection Planning Committee to identify which populations within each subbasin are critical to maintenance and recovery. The U.S. Forest Service, through their land transfer program, can consolidate their holdings within watersheds containing the species. Other groups, both public and private, that are represented on Kentucky and Tennessee's Protection Planning Committees can also work toward developing protection programs for key populations and watersheds.

1.2.2 Meet with local government officials and regional and local planners to inform them of our plans to attempt recovery and request their support.

1.2.3 Meet with the public, local landowners, and local business and/or industry interests and try to elicit their support in implementing protective actions.

1.2.4 Develop an educational program using such items as slide/tape shows, brochures, etc. Present this material to business groups, civic groups, youth groups, church organizations, etc. Educational material outlining the recovery goals, with emphasis on the other benefits of

maintaining and upgrading habitat quality, will be extremely useful in informing the public of our actions.

1.3 Determine threats to the species, conduct research necessary for the species' management and recovery, and implement management where needed.

1.3.1 Characterize the species' habitat (relevant physical, biological, and chemical components) for all life history stages. The blackside dace has been able to withstand some degree of habitat degradation, as most of the present populations exist in streams that are impacted to some degree by increased siltation and other factors. However, some streams' habitats have been so severely altered that the species has been extirpated. Knowledge of the species' habitat requirements and ecological associations is needed to focus management and recovery efforts on the specific problem within the species' habitat.

1.3.2 Conduct life history research on the species to include reproduction, food habits, age and growth, mortality factors, etc. The work of Starnes (1981) and O'Bara (1985) provides some data on the species' life history, but much more information is needed to understand the species' requirements. Unless the species' life cycle and environmental requirements are defined, recovery efforts may be inconsequential or misdirected.

1.3.3 Determine present and foreseeable threats to the species. Coal mining related impacts plus other land management activities have undoubtedly had a significant impact on the blackside dace. However, the mechanism by which the species and its habitat are impacted is not entirely understood, and the extent to which the species can withstand these impacts is unknown. To minimize and eliminate these threats where necessary to meet recovery, the information gathered under tasks 1.3.1 and 1.3.2 must be utilized to target the specific problem areas.

1.3.4 Based on the biological data and threat analysis, investigate the need for management, including habitat improvement. Implement management, if needed, to secure viable populations. Specific components of the

species' habitat may be lacking, and these may be limiting the species' potential expansion. Habitat improvement programs and activities may be helpful in alleviating these limiting factors.

1.3.5 Determine the number of individuals required to maintain a viable population. Theoretical considerations by Franklin (1980) and Soule (1980) indicate that 500 individuals represent a minimum population level (effective population size) which would contain sufficient genetic variation to enable that population to evolve and respond to natural habitat changes. The actual population size in a natural ecosystem can be expected to be larger, possibly by as much as 10 times. The factors which will influence actual population size include sex ratio, length of species' reproductive life, fecundity, extent of exchange of genetic material within the population, plus other life history aspects of these species. Some of these factors can be addressed under Task 1.3.2, while others will need to be addressed as part of this task on a need-to-know basis.

2 Search for additional populations and/or habitat suitable for reintroduction efforts. Two studies of this species, funded by the Service, have been completed (Starnes 1981, O'Bara 1985). They surveyed nearly all available habitat in the upper Cumberland River basin; however, it is possible that some small populations were missed. Further study may yield additional populations, and concurrently, suitable or potential habitat could also be identified for transplants.

3 Determine the feasibility of reestablishing the blackside dace back into historic habitat and reintroduce where feasible. The extent of the blackside dace's historic distribution is unknown, but available records show that it has been extirpated from at least 10 streams (O'Bara 1985). Starnes (1981) reported that, based on his physical habitat evaluation, it may have existed in at least 52 other streams but was eliminated before it was discovered in these waters. O'Bara (1985) found the fish from a total of about 14 stream miles in 30 separate streams; since listing, two new populations and three additional inhabited stream reaches have been found (personal communication, Christopher O'Bara, Tennessee Technological University, and Douglas Stephens, Kentucky Department of Fish and Wildlife Resources, 1988). As many of these populations are isolated, it may not be possible for the species to naturally reinvade its historic habitat. If suitable habitat is now available or can be

made suitable, populations should be reintroduced.

3.1 Develop a successful technique for reestablishing populations. Sufficient stock of blackside dace may not be available to allow for the removal of sufficient adults to establish populations. Techniques for rearing blackside dace and introduction techniques should be developed to help ensure success.

3.2 Coordinate with the U.S. Forest Service, National Park Service, Kentucky Protection Planning Committee, and Tennessee Protection Planning Committee to identify unoccupied habitat within each subbasin which could be utilized for reintroductions and which could be successfully protected after populations become established.

3.3 Reintroduce the species back into their historic range and evaluate success. Using techniques developed in Task 3.1, reintroduce the blackside dace into historic habitat.

3.4 Implement the same protective measures for any introduced populations as outlined for established populations.

4 Develop and implement a program to monitor population levels and habitat conditions of presently established populations as well as newly discovered, introduced, or expanding populations. Once recovery actions are implemented, the response of the species and their habitat must be monitored to assess any progress toward recovery. This will likely require a biennial census schedule.

5 Annually assess overall success of the recovery program and recommend action (changes in recovery objectives, delist, continue to protect, implement new measures, other studies, etc.). The recovery plan must be evaluated periodically to determine if it is on track and to recommend future actions. As more is learned about the species, the recovery objectives may need to be modified.

Literature Cited

Franklin, R.I. 1980. Evolutionary change in small populations. IN: Conservation biology, an evolutionary-ecological perspective. Michael E. Soulé and Bruce A. Wilcox (eds.). Published by Sinauer Assoc., Inc., Sunderland, MA. Pp. 135-149.

Harker, D.F., M.E. Medley, W.C. Houtcooper, and A. Phillippi. 1980. Kentucky Natural Areas Plan, Appendix A. Kentucky Nature Preserves Commission, Frankfort, KY.

O'Bara, C.J. 1985. Status survey of the blackside dace (Phoxinus cumberlandensis). Report to the U.S. Department of the Interior, Fish and Wildlife Service, 100 Otis Street, Room 224, Asheville, NC. 30 pp. plus Appendix.

Soulé, M.E. 1980. Thresholds for survival: maintaining fitness and evolutionary potential. IN: Conservation biology, an evolutionary-ecological perspective. Michael E. Soulé and Bruce A. Wilcox (eds.). Published by Sinauer Assoc., Inc., Sunderland, MA. Ch. 8, pp. 151-169.

Starnes, W.C. 1981. Listing package for the blackside dace (Phoxinus cumberlandensis). Report to the U.S. Department of the Interior, Fish and Wildlife Service, 100 Otis Street, Room 224, Asheville, NC. 41 pp. plus Appendices A and B.

Starnes, W.C., and L.B. Starnes. 1978a. A new cyprinid of the genus Phoxinus endemic to the upper Cumberland River drainage. Copeia 1978: 508-516.

------. 1978b. Status report on a new and threatened species of Phoxinus from the upper Cumberland Drainage. Southeastern Fishes Council Proceedings. 2:2, 2 pp.

PART III

KEY TO IMPLEMENTATION SCHEDULE COLUMNS 1 & 4

General Category (Column 1):

Information Gathering - I or R (Research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminant
13. Reintroduction
14. Other information

Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Priorities within this section (Column 4) have been assigned according to the following:

Priority 1 - An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.

Priority 2 - An action that must be taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.

Priority 3 - All other actions necessary to provide for full recovery of the species.

Blackside dace (Phoxinus cumberlandensis)

Implementation Schedule

*1 General Category	Plan Task	Task Number	Priority	Task Duration	Responsible Agency *2			Estimated Fiscal Year Costs *3			Comments/Notes
					FWS Region	FWS Division	Other*4	FY 1	FY 2	FY 3	
O1-4	Continue to utilize existing legislation and regulations to protect the fish and its habitat.	1.1	1	Continuous	4	FWE	USFS, OSM, NPS, KDSM, TWRA, and THP	1,000	1,000 TVA, KDFWR, KNPC,	1,000	
I1-2, M3, and A1-7	Coordinate with other agencies to identify and protect critical populations for recovery.	1.2.1	2	3 years	4	FWE	USFS, OSM, NPS, KDSM, TWRA, and THP	1,000	1,000 TVA, KDFWR, KNPC,	1,000	
O1	Meet with local governmental officials and business interests and elicit their support for recovery.	1.2.2 and 1.2.3	2	3 years	4	FWE	KDFWR, KNPC, TWRA, and THP	1,000	1,000	1,000	
O1	Develop information and education program and present.	1.2.4	1	3 years	4	FWE	KDFWR, KNPC, TWRA, and THP	2,000	1,000	1,000	
R1-4, 6-8, 9-10, 12, and 14	Conduct research necessary for species management and recovery; i.e., habitat requirements, biology, and threat analysis.	1.3.1, 1.3.2, and 1.3.3	2	3 years	4	FWE	USFS, OSM, NPS, KDSM, TWRA, and THP	30,000	25,000 TVA, KDFWR, KNPC,	25,000	
I4, R4, M3-5, and 7	Based on biological data and threat analysis, investigate the need for management and implement where needed.	1.3.4	2	1 year	4	FWE	USFS, OSM, NPS, KDSM, TWRA, and THP	---	--- TVA, KDFWR, KNPC,	10,000	
R14	Determine number of individuals required to maintain viable population.	1.3.5	3	1 year	4	FWE	KDFWR, KNPC, TWRA, and THP	---	---	??	

Blackside dace (Phoxinus cumberlandensis) **Implementation Schedule**

*1 General Category	Plan Task	Task Number	Priority	Task Duration	Responsible Agency *2			Estimated Fiscal Year Costs *3			Comments/Notes
					FWS Region	FWS Division	Other*4	FY 1	FY 2	FY 3	
I1-2	Search for additional populations and suitable habitat.	2	3	1 year	4	FWE	USFS, KDFWR, KNPC, TWRA, and THP	---	---	10,000	
R7, 13, and M1-2	Develop techniques, select sites, reintroduce the species back into historic habitat, and evaluate and protect any populations established.	3	3 (protection continues)	3 years	4	FWE	USFS, OSM, NPS, TVA, KDFWR, KNPC, KDSM, TWRA, and THP	15,000	15,000	20,000	
I1-2	Develop and implement a monitoring program.	4	3 (biennial)	Continuous	4	FWE	USFS, KDFWR, KNPC, TWRA, and THP	3,000	---	3,000	
O4	Annually assess recovery program and modify program and plan where required.	5	3	Continuous	4	FWE	USFS, OSM, NPS, TVA, KDFWR, KNPC, KDSM, TWRA, and THP	500	500	500	

*1 - See page preceding Implementation Schedule: General Categories for Implementation Schedules.
*2 - Other agencies' responsibility would be of a cooperative nature or projects funded under a contract or grant program. In some cases contracts could be let to universities or private enterprises.
*3 - Note: ALL ESTIMATES ARE FOR FWS FUNDS ONLY.
*4 - Key: USFS - U.S. Forest Service
OSM - Office of Surface Mining
NPS - National Park Service
TVA - Tennessee Valley Authority
KDFWR - Kentucky Department of Fish and Wildlife Resources
KNPC - Kentucky Nature Preserves Commission
KDSM - Kentucky Department for Surface Mining
TWRA - Tennessee Wildlife Resources Agency
THP - Tennessee Heritage Program

LIST OF REVIEWERS

Mr. John Hardcastle
Chapter Chairman
The Nature Conservancy
Capitol Hill Building, Suite 114
301 7th Avenue, North
Nashville, Tennessee 37219

Dr. Dave Etnier
Zoology Department
University of Tennessee
Knoxville, Tennessee 37916

Mr. Elbert T. Gill, Jr.
Commissioner
Tennessee Department of Conservation
701 Broadway
Nashville, Tennessee 37219-5237

Mr. Bruce Bessken
Cumberland Gap National Historical Park
P.O. Box 67
Cumberland Gap, Tennessee 37724

Dr. R. Don Estes, Unit Leader
Tennessee Cooperative Fish and
Wildlife Research Unit
Tennessee Technological University
Box 5114
Cookeville, Tennessee 38505

Mr. D. Elmo Lunn
Technical Secretary
Water Quality Control Board
Tennessee Department of Public Health
150 - 9th Avenue, North
Nashville, Tennessee 37203

Mr. Gary Myers
Executive Director
Tennessee Wildlife Resources Agency
Ellington Agricultural Center
P.O. Box 40747
Nashville, Tennessee 37204

Mr. John E. Alcock
Regional Forester
U.S. Forest Service
1720 Peachtree Road, N.W.
Atlanta, Georgia 30367

Mr. James Wagner
Director
East Tennessee Planning Office
1114 West Clinch Avenue
Knoxville, Tennessee 37901

Mr. G. Floyd Hughes, Jr., Director
Kentucky Department of Highways
Division of Environmental Analysis
419 Ann Street
Frankfort, Kentucky 40601

Mr. Charles W. Martin
Acting Commissioner
Kentucky Department for Surface Mining
Reclamation and Enforcement
3rd Floor, Capital Plaza Tower
Frankfort, Kentucky 40622

Mr. Richard Wengert
Forest Supervisor
Daniel Boone National Forest
P.O. Box 727
Winchester, Kentucky 40391

District Engineer
U. S. Army Corps of Engineers
Nashville District
P.O. Box 1070
Nashville, Tennessee 37202

Dr. Wayne Starnes
Division of Fishes
Smithsonian Institution
Washington, DC 20560

Dr. Brooks Burr
Department of Zoology
Southern Illinois University
Carbondale, Illinois 62901

Mr. Dave Rosenbaum, Director
Division of Abandoned Lands
Department for Natural Resources
Kentucky Natural Resources and
Environmental Protection Cabinet
5th Floor, Capital Plaza Tower
Frankfort, Kentucky 40601

Mr. Robert Knarr, Commissioner and Enforcement
Department for Surface Mining Reclamation
Kentucky Natural Resources and
Environmental Protection Cabinet
5th Floor, Capital Plaza Tower
Frankfort, Kentucky 40601

Mr. Donald Harker, Director
Division of Water
Kentucky Natural Resources and
Environmental Protection Cabinet
5th Floor, Capital Plaza Tower
Frankfort, Kentucky 40601

Mr. Don R. McCormick, Commissioner
Kentucky Department of Fish
and Wildlife Resources
#1 Game Farm Road
Frankfort, Kentucky 40601

Mr. George W. Martin, Regional Director
Kentucky Department of Fish
and Wildlife Resources
Box 46
Barbourville, Kentucky 40906

Mr. Carl Tenut, Assistant Director
Department of Health and Environment
Division of Surface Mining and Land Reclamation
Tennessee Department of Conservation
305 Springdale Avenue
Knoxville, Tennessee 37917

Dr. Branley A. Branson
Department of Biological Science
Eastern Kentucky University
Richmond, Kentucky 40475

Mr. William H. Redmond
Regional Natural Heritage Project
Tennessee Valley Authority
Norris, Tennessee 37828

Mr. John MacGregor
Kentucky Department of Fish
and Wildlife Resources
#1 Game Farm Road
Frankfort, Kentucky 40601

Mr. Richard Hannan
Director
Kentucky Nature Preserve Commission
407 Broadway
Frankfort, Kentucky 40601

Mr. Martin E. Rivers
Director
Environmental Quality Staff
Tennessee Valley Authority
Room 201, Summer Place Building
Knoxville, Tennessee 37902

Mr. George C. Miller, Director
Knoxville Field Office
Office of Surface Mining
530 Gay Street, S.W., Suite 500
Knoxville, Tennessee 37902

Mr. Hord Tipton
Office of Surface Mining
340 Legion Drive, Suite 28
Lexington, Kentucky 40504

Mr. Robert W. Baker
Regional Director
Southeast Region
National Park Service
75 Spring Street, S.W.
Atlanta, Georgia 30303